SM 3H 2017-18

3.7 The Graph of a Rational Function

Name _____ **Date** _____ **Period** _____

1. The graph of a rational function never intersects a _____ asymptote.

2. **True or False** The graph of a rational function sometimes intersects an oblique asymptote.

3. **True or False** The graph of a rational function sometimes has a hole.

Analyze the graph of each function by following the given steps.

1) Factor the numerator and denominator of the function. Find the domain.

2) Write the function in lowest terms.

3) Locate the intercepts of the graph. The *x*-intercepts are the zeros of the numerator of the function that are in the domain of the function.

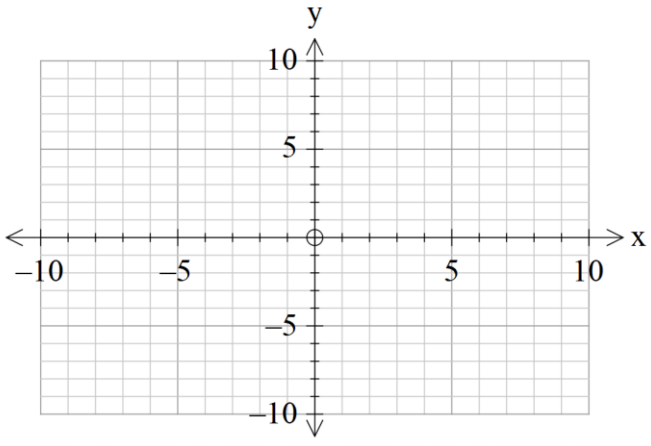
4) Determine the vertical asymptotes. Graph each vertical asymptote using a dashed line.

5) Determine the horizontal or oblique asymptote, if one exists. Determine points, if any, at which the graph intersects the asymptote. Graph the asymptote with a dashed line. Plot any points at which the graph intersects the asymptote.

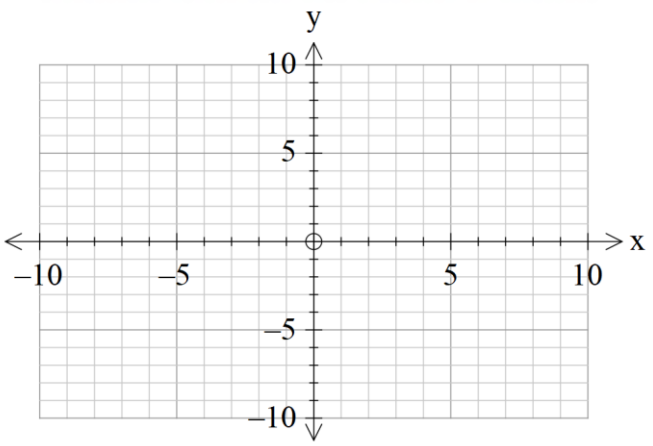
6) Use the zeros of the numerator and denominator of the function to divide the *x*-axis into intervals. Determine where the graph is above or below the *x*-axis by choosing a number in each interval and evaluating the function there. Plot the points found.

7) Use the results from above to graph the function.

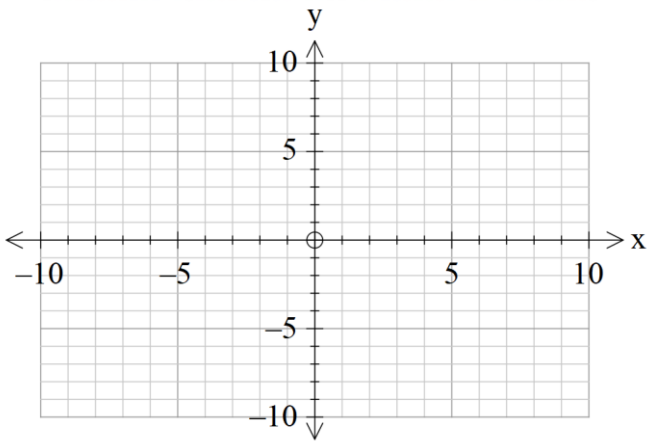
4. $R(x) = \dfrac{3x+3}{2x+4}$



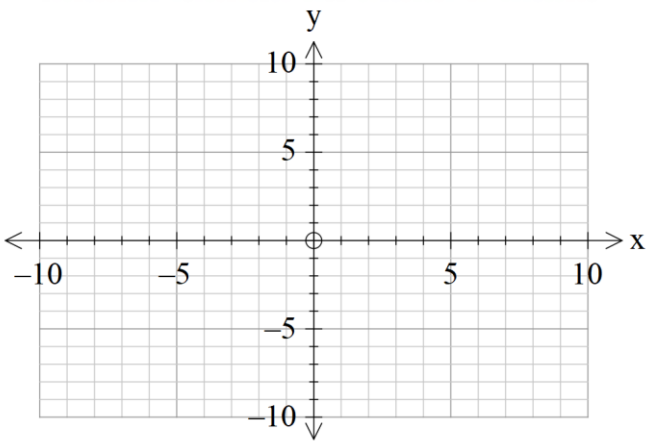
5. $R(x) = \dfrac{3}{x^2 - 4}$



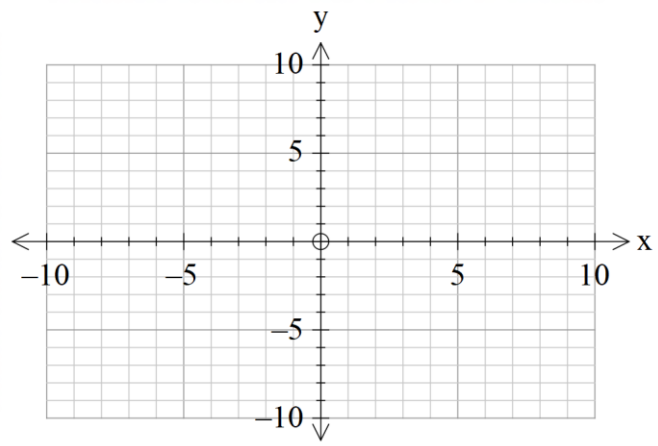
6. $R(x) = \dfrac{x^4 + x^2 + 1}{x^2 - 1}$



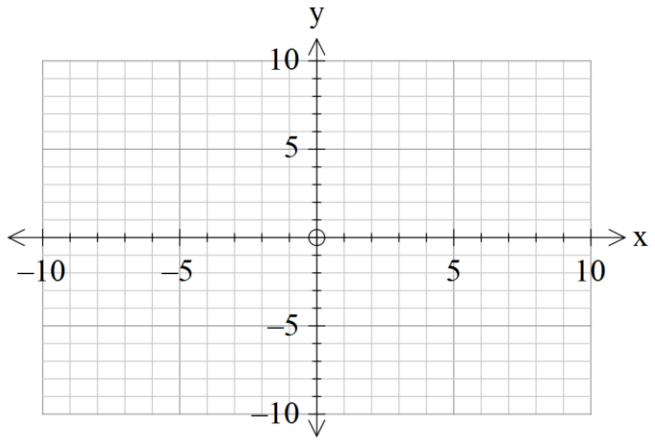
7. $R(x) = \dfrac{x^3 - 1}{x^2 - 9}$



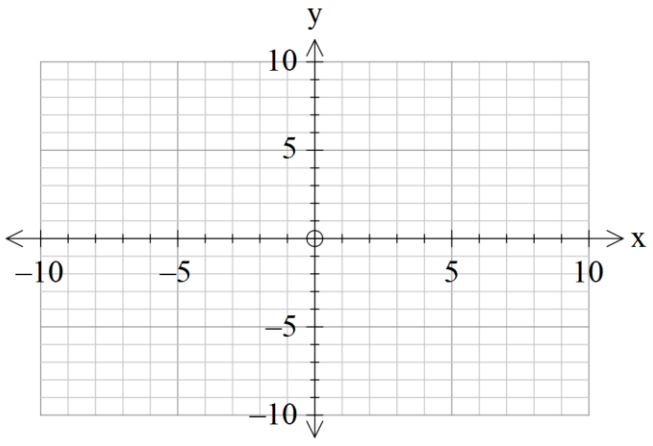
8. $R(x) = \dfrac{x^2}{x^2 + x - 6}$



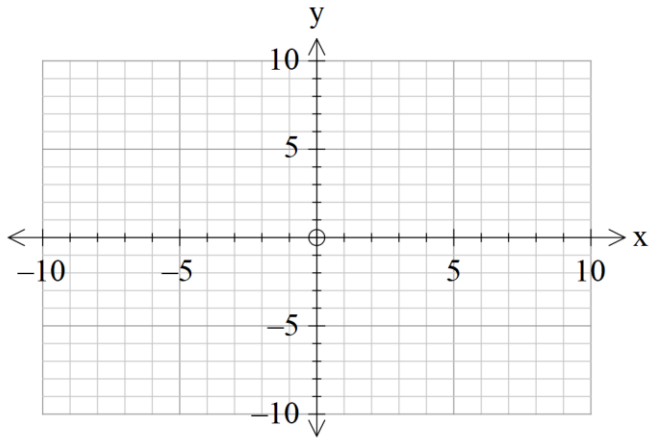
9. $R(x) = \dfrac{x^2 - 1}{x^4 - 16}$



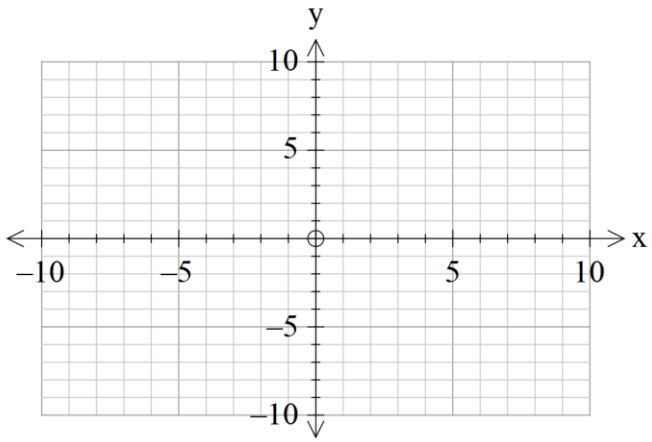
10. $R(x) = \dfrac{x^2 - 3x - 4}{x + 2}$



11. $R(x)=\dfrac{x^2+x-12}{x-4}$

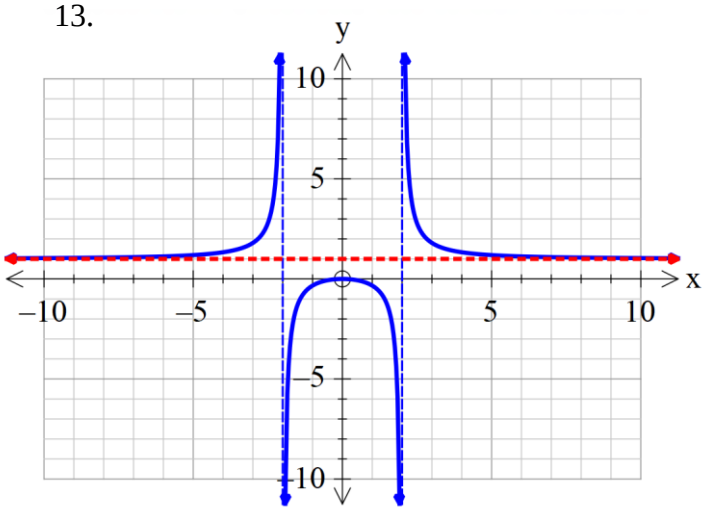


12. $R(x)=\dfrac{x^2+x-12}{x^2-x-6}$

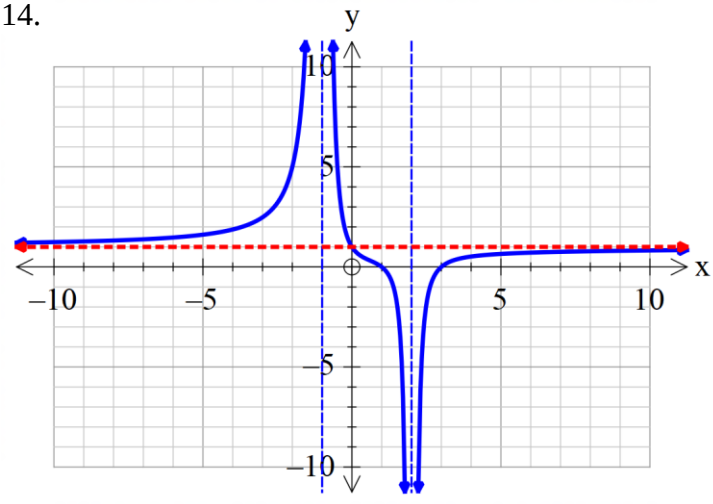


Find a rational function that might have the given graph. (More than one answer might be possible.)

13.



14.



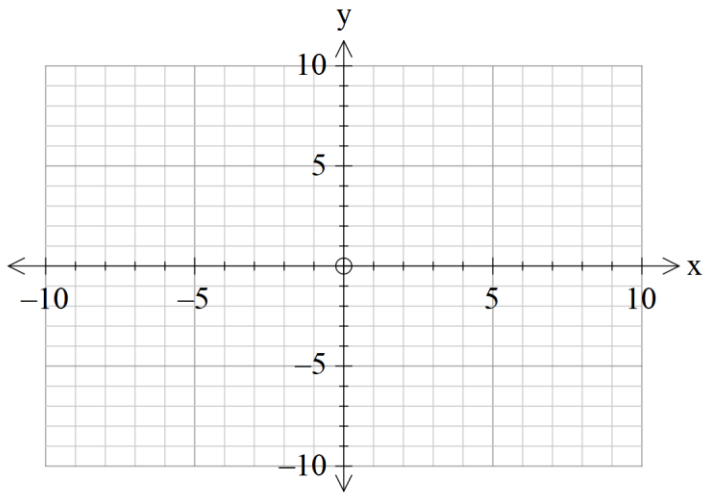
Review

Sketch the graph. Label at least three points on the graph.

15.

$$f(x)=\begin{cases}-3x, & \text{if } x<-1\\ 0, & \text{if } x=-1\\ 2x^2+1, & \text{if } x>1\end{cases}$$

find : *a*) $f(-2)$ *b*) $f(-1)$ *c*) $f(0)$



16. Find the function that is finally graphed after each of the following transformations is applied to the graph of $y=\sqrt{x}$.

1) Reflect about the *x*-axis.

2) Shift right 3 units.

3) Shift down 4 units.

17. Sketch the graph of the following function using transformations. Start with the parent table, list the transformations, make the table for the transformed function, and then graph the new function.

$f(x)=3(x-2)^2+1$